



1995-96 KIRIS OPEN-RESPONSE ITEM SCORING WORKSHEET

Grade 4 — Science Question 3

The academic expectations applied in this item include:

2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

2.3 Students identify and analyze systems and the ways their components work together or affect each other.

The core content assessed by this item includes:

Process

- Data is used to construct a reasonable explanation.
- Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.

Content

- The Characteristics of Organisms
 - * Organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can only survive in environments in which their needs can be met.
- Organisms and Their Environments
 - * Plants make their own food. All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.

3. A Closed Living System

Lee made a terrarium by putting soil, plants, small insects, and some water in a sealed jar. Explain how it was possible for the plants and animals to survive over a period of time in a sealed container where neither air nor water could get in or out.

Background Information:

- In the closed system, plants become food for insects which eventually die, decay, and become nutrients for plants.
- Water is constantly recycled through both plants and animals in addition to the water cycle mentioned above.
- In the process of producing food by photosynthesis, plants take in carbon dioxide and give off oxygen. Animals, in this case insects, in the process of respiration, take in oxygen and give off carbon dioxide. (Plants also undergo the process of respiration as they use the food they produce, but not in the same magnitude as photosynthesis.)
- When the system is balanced, as it will tend to be after time, populations will stabilize and these processes will continue indefinitely.

SCORING GUIDE

Score	Description
4	Student explains the interdependence of the organisms in the system and how plants and animals each contribute to the system. The explanation involves three interactions: the oxygen/carbon dioxide cycle, the water cycle, and the food chain/nutrient cycle.
3	Student explains the interdependence of the organisms in the system. The explanation contains limited detail, some minor misconceptions, and explains two of the three interactions. Student identifies recycling as necessary to the system by making a positive statement or by implying the necessity of recycling.
2	Student explains the interdependence of the organisms in the system. The explanation describes only one of the three interactions or only partially explains more than the basic interdependence of the organisms in the system.
1	Student explains the interdependence of the organisms in the system. The explanation is weak, incomplete, contains many errors, and shows only a minimal understanding. The explanation describes only the simplest needs of the organisms in the system or only partially describes one of the three interactions.
0	Response is incorrect or irrelevant.
BLANK	Blank/no response.

Interactions that will appear in student responses:

- Water Cycle - Repeated evaporation and condensation of water in the system
- Oxygen/Carbon Dioxide Cycle - Involves exchange of gases between plants and animals
- Photosynthesis - Food production through entry of external energy
- Food Chain - Plants as producers are in turn eaten by animals*
- Nutrient Cycle - Recycling nutrients through consuming and decaying*

*Notes:

- The food chain and the nutrient cycle must be combined into the same interaction.
- Just discussing insects eating plants is not sufficient for one interaction unless the response also includes information about the insects' dying and the nutrients' recycling.



KIRIS ASSESSMENT ANNOTATED RESPONSE

GRADE 4 SCIENCE

Sample 4-Point Response of Student Work

It was possible for the plants and animals to survive by the insects breathing the air from the plants and giving back carbon dioxide for the plants. The moisture collected from the top of the jar would rain back down and give water to plants and animals. When the insects die they decay & turn into the plants food. The soil collects the decayed animal & lets it absorb its energy into the plant.

Student explains the interdependence of the organisms in the system. The explanation involves the oxygen/carbon dioxide cycle, the water cycle, and the nutrient cycle/food chain.

Student demonstrates an ability to use data to construct a reasonable explanation.

Student demonstrates an application of scientific ways of thinking and working and uses those methods to solve real-life problems.

Student demonstrates a knowledge that plants make their own food. All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.

Student demonstrates a knowledge that organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can only survive in environments in which their needs can be met.

Student demonstrates an understanding that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.

Student demonstrates an application of systems and the ways their components work together or affect each other.



KIRIS ASSESSMENT ANNOTATED RESPONSE

GRADE 4 SCIENCE

Sample 3-Point Response of Student Work

I think the insect and the plant would live because the plants will give off oxygen and the insect will breathe the oxygen and then the insect let out the air and the plant breathe it and it turn back in to oxygen. and the water would evaporate and go up and hit the top of the jar and the water would come back down.

Student explains the interdependence of the organisms in the system. The explanation involves the oxygen/carbon dioxide cycle and the water cycle.

Student demonstrates an ability to use data to construct a reasonable explanation.

Student demonstrates an application of scientific ways of thinking and working and uses those methods to solve real-life problems.

Student demonstrates a knowledge that plants make their own food. All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.

Student demonstrates a knowledge that organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can only survive in environments in which their needs can be met.

Student demonstrates an understanding that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.

Student demonstrates an application of systems and the ways their components work together or affect each other.



KIRIS ASSESSMENT ANNOTATED RESPONSE

GRADE 4 SCIENCE

Sample 2-Point Response of Student Work

Lee made a terrarium by putting some soil, water, plants, and small insects in a sealed jar. It was possible for the plants and animals to live in the sealed container because, when the animals breathe they breathe out carbon dioxide. Well, the plants like carbon dioxide. In fact plants turn it into oxygen. So the animals don't have a problem breathing, but what about the water. Well, the water will go into the water cycle. It can actually rain in there.

Student explains the interdependence of the organisms in the system. The explanation involves the oxygen/carbon dioxide cycle. The water cycle is mentioned, but not explained.

Student demonstrates some ability to use data to construct a reasonable explanation.

Student demonstrates some application of scientific ways of thinking and working and uses those methods to solve real-life problems.

Student demonstrates some knowledge that plants make their own food. All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.

Student demonstrates some knowledge that organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can only survive in environments in which their needs can be met.

Student demonstrates some understanding that scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.

Student demonstrates some application of systems and the ways their components work together or affect each other.



KIRIS ASSESSMENT ANNOTATED RESPONSE

GRADE 4 SCIENCE

Sample 1-Point Response of Student Work

Lees small insects lived on the plants and water. That might last them for about two days then Lees' insects would die. They would not have any oxygen to breathe so they would die.

Student explains the interdependence of the organisms in the system. The explanation is incomplete and shows only a minimal understanding of the interdependence of the organisms.

INSTRUCTIONAL STRATEGIES

A Closed Living System

Students conduct experiments with plants using soil, water, and sunlight as the variables. Students record the changes on a spreadsheet and display the results using computer graphics.

Students observe, chart, and explain changes that occur in an aquarium or a terrarium over a two-month period. Students compare changes such as sunlight, water, temperature, plant life, and animal life.

Students design a flow chart that illustrates the production/consumption chain for a class aquarium or terrarium.

Students identify subsystems in a pond, forest, or an aquarium and investigate the interactions of the subsystems.

Students collect data, pictures, or artifacts showing the decay of a leaf, food, or a log and explain the role of decomposition in a food chain.

Students develop an original experiment testing the various needs of plants. Students decide which variables will be controlled and which will be tested.

Students collect pictures of different animals and plants from a specific environment and create a food web by making connections with yarn of all the food relationships between the organisms.

Students create a food web of a meal that a person might consume and mark the location of the producers and consumers.